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Markovian dynamics of decoherence for two coupled oscillators in thermal environment

Assuming an open quantum system consisting of two coupled oscillators, we investigate the evolution of quantum correlations and purity in an equilibrium thermal environment with regard to the Born-Markov approximation. We assume squeezed vacuum state as the initial state of the system and study the effect of repulsive and attraction interaction on the correlations. In addition, their dependence on the temperature, the asymmetric parameter, the dissipation coefficient, and the squeezing parameter is studied. In general, the evolution of discord for two coupled oscillators is erratic, whereas the evolution of entanglement is monotonic. For attraction interaction, entanglement is amplified and survives for a long time with respect to repulsive interaction; however, discord does not have a definite behavior. Additionally, it has been found that correlations and their sudden death time depend less on temperature and dissipation coefficient and more on the amount of squeezing. On the other hand, variation of the asymmetric parameter does not have any appreciable effect on the evolution of discord, but entanglement is a decreasing function of that. Moreover, decoherence is an increasing function of the temperature, dissipation coefficient, and coupling constant but does not depend on the asymmetric parameter. Furthermore, as the squeezing parameter is increased, the fade-out time of decoherence decreases.

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